Northern white-cedar

Thuja occidentalis

Northern white-cedar is a slow-growing species found mainly on wetter sites in northern Wisconsin. The volume of northern white-cedar has not changed significantly since 1996. However, this species is maturing with an increase in the number of sawtimber trees and a decrease in seedlings, saplings and poles. Deer browse may be impacting northern white-cedar regeneration. Mortality rates and the rate of removals to growth are very low for this species.

Northern white-cedar is not an important timber species, accounting for only 0.2% of roundwood product. Currently, we harvest only 14% of total growth. The density of northern white-cedar wood is the lowest of all tree species which makes it less desirable for biofuel production.

"How has the northern white-cedar resource changed?"

Growing stock volume and diameter class distribution

The growing stock volume of northern white-cedar in 2012 was about 691 million cubic feet or about 3.2% of total statewide volume (Chart 1). Volume increased 46% since 1983 but has not changed since 1996.

The northern white-cedar resource has aged. For instance, the volume in large trees (over 13 inches in diameter) has more than doubled since 1983 (Chart 2).

The number of sawtimber-sized trees has increased significantly since 1996 (Chart 3). The number of saplings and poles has decreased however, suggesting a possible decrease in future populations. The number of seedlings decreased 30% between 2003 and 2012.

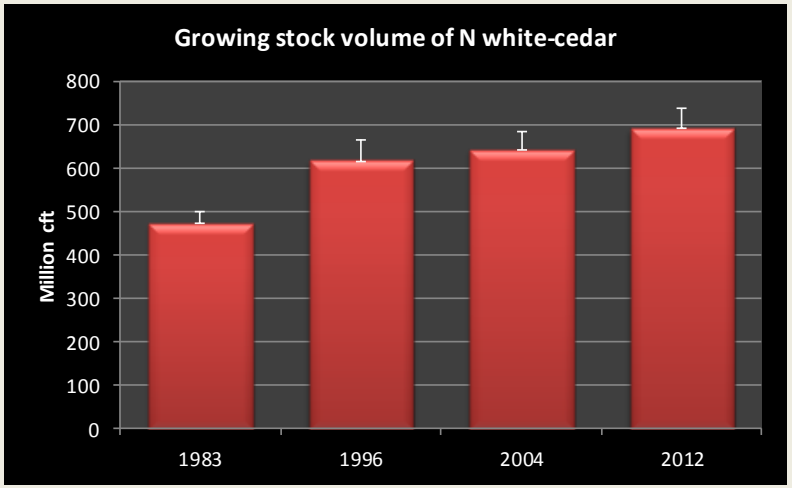


Chart 1. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2012.

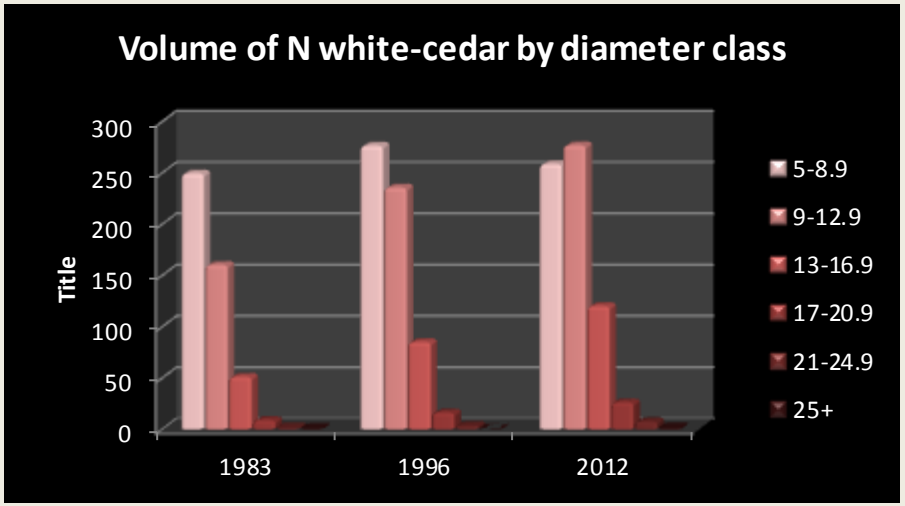


Chart 2. Growing stock volume (trees over 5 inches dbh) in million cubic feet in 1983, 1996, and 2012.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2012.

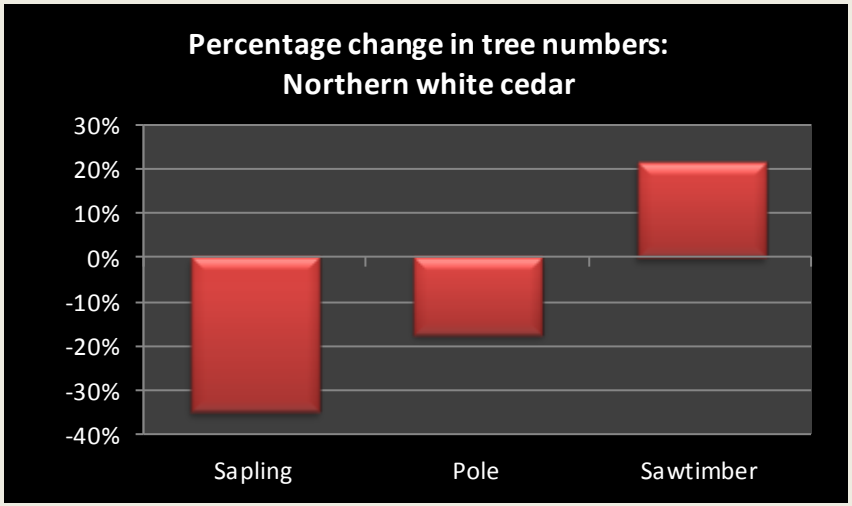
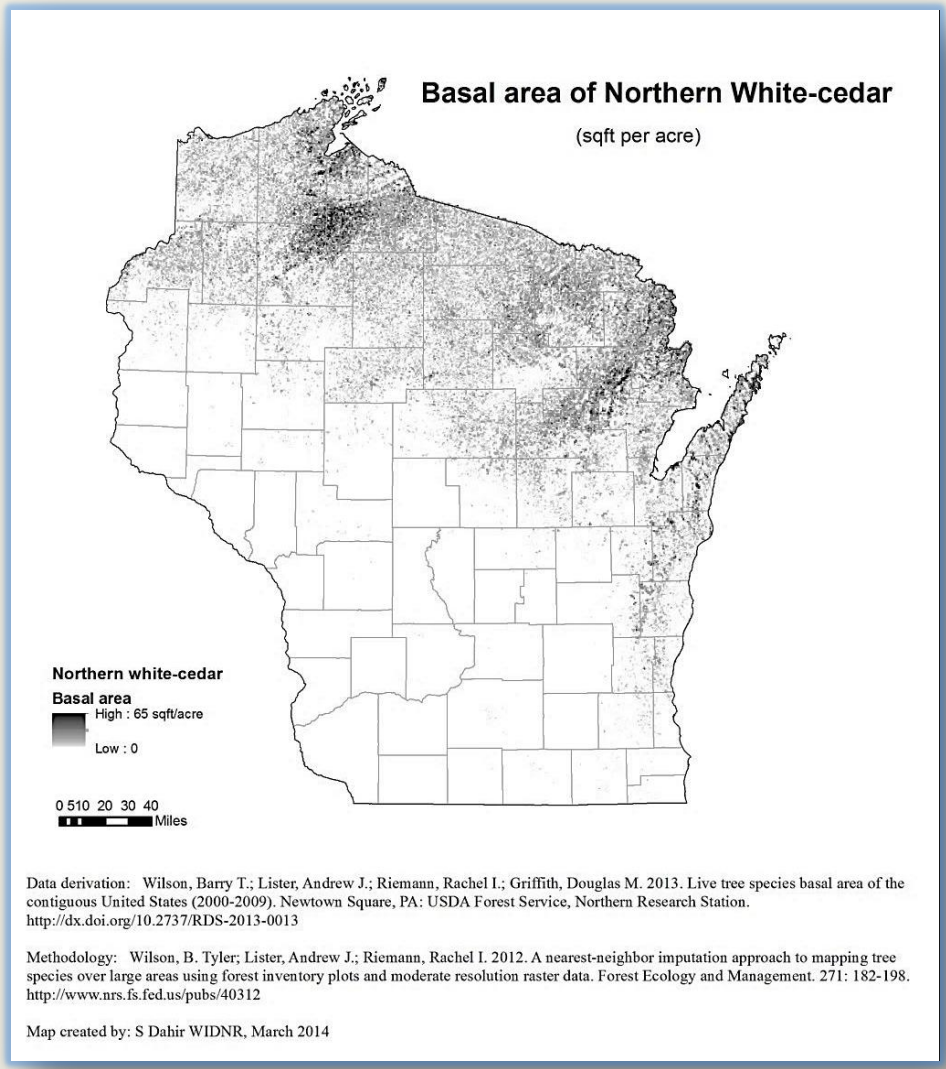


Chart 3. Percentage change in the number of live trees by size class between 1996 and 2012.
Source: USDA Forest Inventory and Analysis data 1996, and 2012.

"Where does northern white-cedar grow in Wisconsin?"

Growing stock volume by region with map



Data derivation: Wilson, Barry T.; Lister, Andrew J.; Riemann, Rachel I.; Griffith, Douglas M. 2013. Live tree species basal area of the contiguous United States (2000-2009). Newtown Square, PA: USDA Forest Service, Northern Research Station. http://dx.doi.org/10.2737/RDS-2013-0013

Methodology: Wilson, B. Tyler; Lister, Andrew J.; Riemann, Rachel I. 2012. A nearest-neighbor imputation approach to mapping tree species over large areas using forest inventory plots and moderate resolution raster data. Forest Ecology and Management. 271: 182-198. http://www.nrs.fs.fed.us/pubs/40312

Map created by: S Dahir WIDNR, March 2014

Three quarters of northern white-cedar volume is located in northern Wisconsin with 20% in the southeast.

Most northern white-cedar volume is located on mesic to wet-mesic and wet-mesic to wet habitat types.

Growing stock volume (million cubic feet) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total
N white-cedar	38	347	170	137	-	**691**
% of total	**5%**	**50%**	**25%**	**20%**	**0%**	**100%**

Source: USDA Forest Service, Forest Inventory and Analysis 2012 data

For a table on **Volume by County for 2012** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/VolumeCountySpecies.pdf

"How fast is northern white-cedar growing?"

Average annual net growth and ratio of growth to volume

Average annual net growth, about 14.3 million cubic feet per year from 2008 to 2012, accounts for 2.5% of total statewide growth (Chart 4). The growth rate has increased by 41% since 1996.

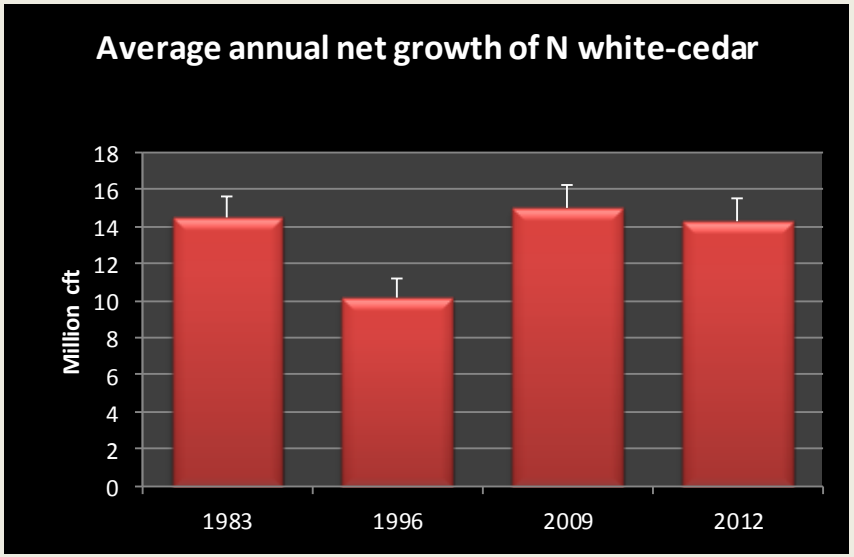


Chart 4. Average annual net growth (million cubic feet).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2012

Average annual net growth (million cubic feet/year) and ratio of growth to volume by region of the state.

Region	Net growth	Percent of Total	Ratio of growth to volume
Northeast	6.8	48%	**2.0%**
Northwest	3.4	24%	**2.0%**
Central	1.0	7%	**2.7%**
Southwest	0.0	0%	**-**
Southeast	3.0	21%	**2.2%**
Statewide	14.3	**100%**	**2.1%**

Source: USDA Forest Inventory and Analysis 2012.

The highest volume growth for northern white-cedar is in the northeast region of the state but the highest rates of growth to volume are in central Wisconsin.

The average ratio of net growth to volume for northern white-cedar is 2.1%, **lower than the statewide average** of 2.6% for all species.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How healthy is northern white-cedar in Wisconsin?"

Average annual mortality and the ratio of mortality to growth

Average annual mortality of northern white-cedar from 2008 to 2012 was about 1.9 million cubic feet, or 0.8% of statewide mortality (Chart 5). Mortality has decreased significantly since 1996.

The ratio of mortality to gross growth is about 11.6% for northern white-cedar. This is **significantly lower than the average** for all species in Wisconsin which is 28.8%.

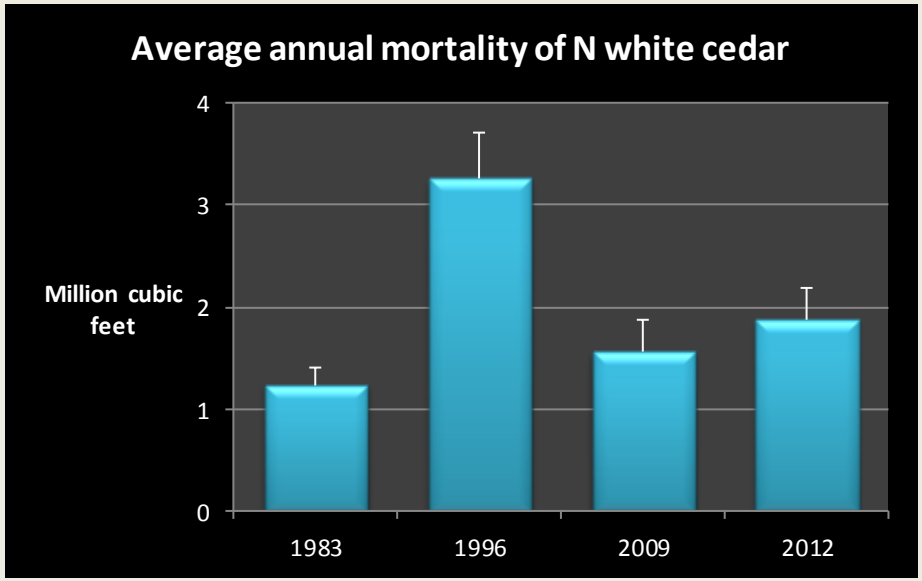


Chart 5. Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2009 and 2012

Mortality, gross growth, and the ratio of mortality to gross growth.

Species	Average annual mortality (cft)	Average annual gross growth (cft)	Mortality / growth
Northern white-cedar	1,874,790	16,215,451	**11.6%**

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much northern white-cedar do we harvest?"

Roundwood production by product and ratio of removals to growth

In 2009, Wisconsin produced about 570,000 cubic feet of cedar roundwood, or about 0.2% of the total harvest (Chart 6). Cedar roundwood production has decreased 56% since 2002.

Cedar is used mostly for fuelwood which accounts for over half of all roundwood.

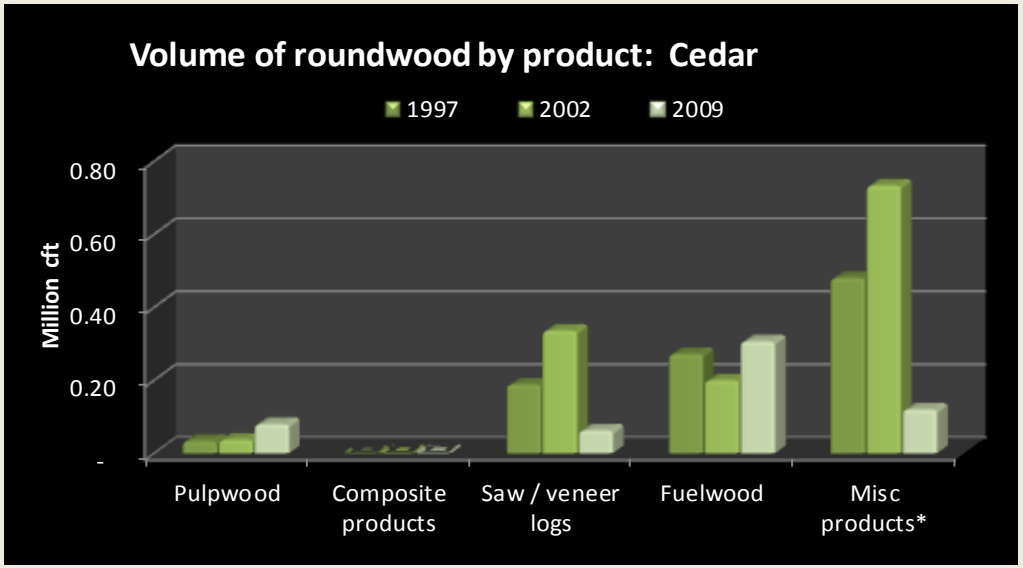


Chart 6. Volume of roundwood products. * Miscellaneous products include poles, posts and pilings.
Source: Ronald Piva, USDA Forest Service, Northern Research Station, St. Paul MN

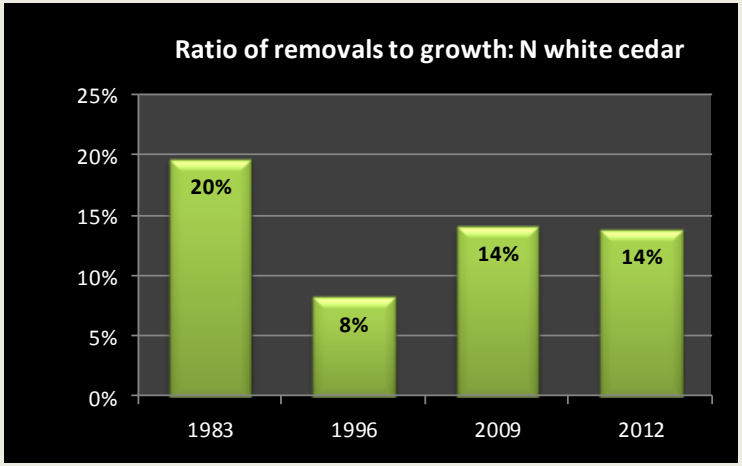


Chart 7. Ratio of volume harvested annually to net growth.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2012.

The ratio of removals to growth is 14% for northern white-cedar, much lower than the statewide average ratio of 53% (Chart 7). Whereas northern white-cedar accounts for 3.2% of growing stock volume in the state, it makes up only 0.7% of removals.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much is northern white-cedar selling for?"

Prices for cordwood and sawtimber: trends

The average stumpage price for northern white-cedar has been falling from its peak in 2005-2007 (Chart 8) but removals of growing stock have generally been steady since then.

Average weighted stumpage values, as reported in Wisconsin administrative code, have been falling and are currently lower than the statewide average for all conifer pulpwood and sawlogs.

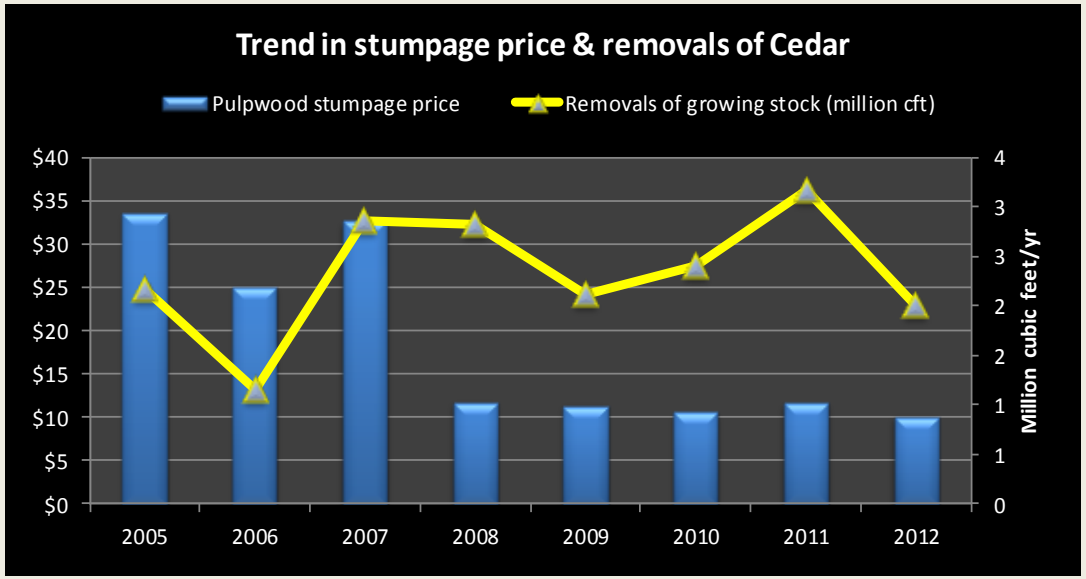


Chart 8. Trends in sawtimber stumpage prices (NR46) and removals of growing stock on timberland (FIA 2012).

Average weighted stumpage prices (adjusted for inflation to 2012 dollars) by year for Wisconsin.

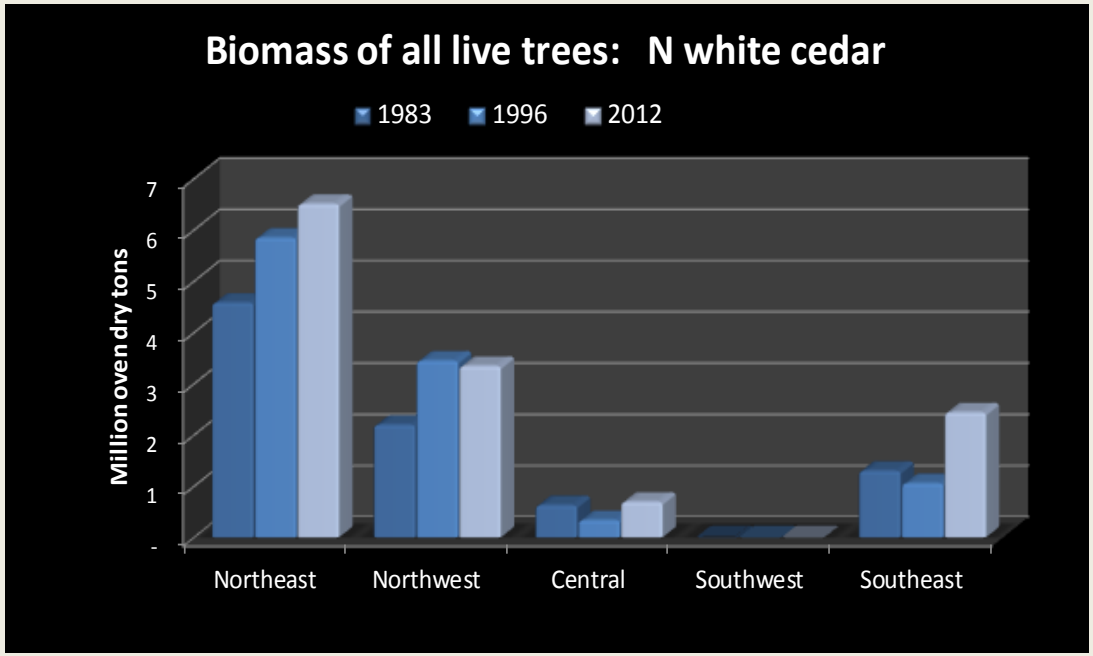
Product	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average for all conifers
Cordwood (per cord)	$25	$34	$25	$33	$12	$11	$11	$12	**$10**	$34
Logs (per MBF)	$112	$90	$146	$401	$84	$88	$86	$110	**$97**	$110

Source: Wisconsin Administrative Code Chapter NR46, 2002 to 2012. The stumpage values calculated each year are for the sole purpose of assessing MFL yield and FCL severance taxes, not for determining the price that should be received for timber.

"How much northern white-cedar biomass do we have?"

Tons of aboveground biomass by region of the state

There were 13.0 million short tons of aboveground biomass in live northern white-cedar trees in 2012, up from about 8.7 million tons in 1983, an increase of 49.2%. This is equivalent to approximately 6.5 million tons of carbon and represents 2.1% of all aboveground biomass statewide. As with volume, most northern white-cedar is located in northern Wisconsin (Chart 9).



Northern white-cedar has the lowest density of any of the commercial tree species in Wisconsin, with a ratio of biomass to volume of 22 oven-dry lbs. per cubic foot. The average for all softwoods is about 26 ODP/cubic feet and for all species is 33 ODP/cubic feet. Approximately, 74% of biomass is located in the bole and 13% in the top branches.

For a table of **Biomass by County for 2012** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/BiomassByCounty.pdf